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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,278	06/30/2004	Daniel J. Weyers	148115	4277
23413	7590	07/29/2005	EXAMINER	
CANTOR COLBURN, LLP			SHIPMAN, JEREMIAH E	
55 GRIFFIN ROAD SOUTH			ART UNIT	PAPER NUMBER
BLOOMFIELD, CT 06002			2859	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/710,278	WEYERS ET AL.	
	Examiner	Art Unit	
	Jeremiah Shipman	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/30/04.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 June 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8 and 14-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The conditional wording "the coil has a Q-factor equal to or greater than about 50% the Q-factor if the sheet were made of solid copper" does not clearly define the invention. A person versed in the art would not know the limits of the claimed invention when the sheet material is not made of solid copper. Further, the limitation "equal to or greater than about" is considered indefinite (See MPEP §2173.05(b)). Finally, the relationship of a material thickness to the Larmor frequency of protons is vague, since the wording "equal to or greater than about" covers a relatively broad range and further depends from another relatively broad range of frequencies related to the magnetic field strength.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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Claims 1 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Richard et al. (US 5,592,087).

Regarding claim 1, Richard et al. disclose an apparatus for MRI (col 1, lines 7-14), comprising an RF birdcage coil having a coil axis, an end ring portion disposed about that axis, and a plurality of legs disposed parallel to the axis and in signal communication with the end-ring portion (col 2, lines 61-65; Fig 5), and an RF shield disposed about the coil (col 2, lines 62-64) and in signal communication therewith, the shield comprising a cylindrical conductive sheet having first and second ends (col 4, lines 24-28), a plurality of sets of discontinuous slots disposed about the cylindrical sheet and running between the first and second ends (col 4, lines 31-35; Fig 5), wherein a region of discontinuity within a set of the slots aligns with the end ring portion (col 5, lines 57-62; Figure 5).

Regarding claim 4, Richard et al disclose that the number of sets of discontinuous slots is equal to or greater than the number of legs (Fig 5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Frederick (US 5,367,261). Richard fails to teach that the region of discontinuity has an axial length equal to or greater than the width of the end ring portion. Frederick teaches an RF shield for a birdcage coil (abstract, lines 1-5) with end-ring conductors corresponding to and lined up with the end-rings of the birdcage (col 2, lines 51-53; col 5, lines 49-53). These conductors serve the same physical shielding purpose as the discontinuities in applicant's slots (RF shielding of the end-ring portions of the birdcage coil). Frederick's conductors have a width (determined by maximizing the Q-factor of the coil) equal to or greater than twice the width (and thus greater than the width) of the conductors in the birdcage coil (col 2, lines 49-69; col 6 lines 1-2). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teaching of Frederick to the teaching of Richard et al. for determining the geometry of the conductors in the RF shield to maximize the Q-factor of the RF coil (Frederick, col 5, lines 56-59) and minimize the interaction of the resultant RF coil with the gradient coil assemblies (Frederick, col 6, lines 32-37), which is the purpose of the shield.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of de Swiet et al. (US 2004/0113617). Richard et al lack an RF shield comprising a material having an electrical conductivity equal to or greater than about 2% and equal to or less than about 20% the electrical conductivity of pure copper. De Swiet et al. disclose shields disposed about RF coils in an MRI apparatus (paragraphs 5-6), which may be made of a poor

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conductor (paragraph 29, lines 19-21). It would have been obvious to a person skilled in the art at the time of the invention to apply the teaching of de Swiet to the teaching of Richard in order to better reduce eddy current circulation (de Sweit, paragraph 19, lines 27-29).

Claims 6-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Morich et al. (US 5,406,204). Richard lacks a shield which comprises a mesh, a mesh which comprises a copper alloy, and a mesh embedded in epoxy at the gradient coil. Morich et al disclose an RF shield for use in an MRI apparatus (col 1, lines 11-19) which comprises a mesh (col 5, lines 27-30), a mesh comprising a copper alloy (col 5, lines 27-30, copper is a copper alloy), and a mesh embedded in epoxy at the gradient coil (col 5, lines 50-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Morich to the teachings of Richard in order to gain the conventional advantages of a mesh shield over a foil shield—cost effectiveness and the mesh's intrinsically lessened conduction of low-frequency eddy currents (i.e., it will interfere less with the gradient pulses) (Morich, col 2, lines 54-56)—as well as the advantage of being easier to embed in epoxy (Morich, col 5, lines 52-55).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Morich et al as discussed above, and further in view of Frederick. The combination of Richard and Morich lacks a region of discontinuity in the slots having an axial length equal to or greater than the width of the end

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ring portion of the birdcage coil. Frederick teaches this limitation, as discussed above in regard to claims 2 and 3.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Hayes et al. (US 4,642,569).

Regarding claim 11, Richard et al. fail to teach that the plurality of sets of slots are disposed between the plurality of legs. Hayes et al. teach an RF shield for a magnetic resonance apparatus (col 1, lines 6-10) with slots etched therein, creating conductive strips which are parallel to and centered on the conductors of the RF coil (col 4, lines 61-68; col 5 lines 1-3). This means that the etched slots must be located between the legs of the RF coil. It would have been obvious to a person of ordinary skill in the art at the time of the invention to apply the teaching of Hayes to the teaching of Richard in order to improve the performance of the RF shield as explained by Hayes (col 4, lines 48-58).

Regarding claim 12, Richard's slots are equally spaced (Fig. 5).

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Sugimoto (US 4,785,246). Richard et al. fail to teach an RF shield comprising an integrally formed capacitor running lengthwise between the first and second ends, the capacitor being disposed only partially around the circumference of the cylindrical sheet. Sugimoto teaches an RF shield for an MRI apparatus (col 2, lines 26-34) comprising such an integrally formed capacitor (col 4, lines 42-56; Fig 8). It would have been obvious to a person of ordinary skill in the art at the time of the invention to apply the teaching of Sugimoto to the teaching of Richard et al, in order to provide a shield which blocks high frequency

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RF fields while passing low frequency gradient fields (Sugimoto, col 4, lines 21-24, 51-54).

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Richard et al. in view of Morich et al., and further in view of Sugimoto. Richard et al. disclose an apparatus for MRI (col 1, lines 7-14), comprising an RF birdcage coil having a coil axis, an end ring portion disposed about that axis, and a plurality of legs disposed parallel to the axis and in signal communication with the end-ring portion (col 2, lines 61-65; Fig 5), and an RF shield disposed about the coil (col 2, lines 62-64) and in signal communication therewith, the shield comprising a cylindrical conductive sheet having first and second ends (col 4, lines 24-28), a plurality of sets of discontinuous slots disposed about the cylindrical sheet and running between the first and second ends (col 4, lines 31-35; Fig 5), wherein a region of discontinuity within a set of the slots aligns with the end ring portion (col 5, lines 57-62; Figure 5). Richard fails to teach a shield comprising a copper alloy mesh and an integrally formed capacitor disclosed only partially around the circumference of the cylindrical sheet. Morich et al disclose an RF shield for use in an MRI apparatus (col 1, lines 11-19) which comprises a mesh (col 5, lines 27-30), a mesh comprising a copper alloy (col 5, lines 27-30, copper read is copper alloy), and a mesh embedded in epoxy at the gradient coil (col 5, lines 50-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Morich to the teachings of Richard in order to gain the conventional advantages of a mesh shield over a foil shield—cost effectiveness and the mesh's intrinsically worse conduction of low-

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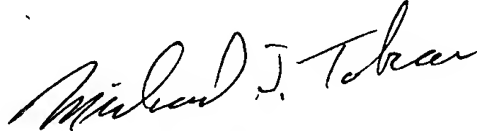
frequency eddy currents (i.e., it will interfere less with the gradient pulses) (Morich, col 2, lines 54-56)—as well as the advantage of being easier to embed in epoxy (Morich, col 5, lines 52-55). The combination of Richard and Morich now only fails to teach an RF shield comprising an integrally formed capacitor running lengthwise between the first and second ends, the capacitor being disposed only partially around the circumference of the cylindrical sheet. Sugimoto teaches an RF shield for an MRI apparatus (col 2, lines 26-34) comprising such an integrally formed capacitor (col 4, lines 42-56; Fig 8). It would have been obvious to a person of ordinary skill in the art at the time of the invention to apply the teaching of Sugimoto to the teaching of Richard et al, in order to provide a shield which blocks high frequency RF fields while passing low frequency gradient fields (Sugimoto, col 4, lines 21-24, 51-54).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Schenck et al. (US 6,437,567) discusses the practice of aligning the conductors of the RF shield with the conductors of the RF coil for better shield performance in an MRI apparatus.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS


Michael Tokar
Supervisory Patent Examiner
Technology Center 2800